Weather Event Simulator
Late Spring Destructive Squall Line in the Ark-La-Tex
2-3 June 2004
Case Summary

Originating Office	:	WFO Shreveport
Date of Case	:	2-3 June 2004 (GMT)
Contacts	:	Ken Falk (Ken.Falk@noaa.gov)
Weather Event	:	A severe squall line with intense outflow boundary in northwest flow regime.
Learning Objectives	:	To recognize MARC radar signatures and that the winds just behind the gust front, well ahead of the squall line, were doing most of the damage.
Available Data	:	All AWIPS radar data for KSHV WSR-88D
	:	All AWIPS model guidance fields
	:	All AWIPS satellite imagery (Regional scale)
	:	All AWIPS lightning and metar data
Time Period of Data	:	1200 UTC 2 June 2004 - 0200 UTC 3 June 2004
Type of Simulation	:	Virtual reality simulation – self study.
Completion Time	:	30 minutes (Part A); 70 minutes (Part B).
Additional Materials	:	Simulation Guide (three pages).
Installation	:	This case was made with WES 5.0 software. Convert the case to DRT prior to running the simulation.

Late Spring Destructive Squall Line in the Ark-La-Tex
WES Simulation Case – 2 June 2004 and 3 June 2004

Bill Murrell (forecaster) and Ken Falk (SOO)
WFO Shreveport, LA

Name: _____ Date: _____

The case study concerns a major severe weather event that occurred in late spring in northwest flow with strong instability. This event occurred after two days of significant severe weather over the Ark-La-Tex generally along and south of Interstate 20. This event will cover time periods of two days, crossing over the 00z time period from 2 June 2004 to 3 June 2004 (GMT).

Part A: Environment and Radar Analysis

I. Environment

Let's take a look at the environment for **2 June 2004**.

At the WES, run the simulation for **2004 Jun 2** for the times 2350Z to 2359Z (This will load model and radar data for a quick evaluation).

During this first part of the simulation (~ 30 minutes) you will evaluate the environment and begin to analyze the radar data. However you will not issue any warnings (that will occur in **Part B**).

Evaluate MODEL data.
ETA and GFS available 12z and 18z
NGM available 12z

1. What are the general 250 mb height and wind speed patterns over the Southern Plains into the Lower and Mid Mississippi Valley? Is there a jet streak or favorable jet structure?

   _____
   _____
   _____
   _____

2. What is the general 500 mb height and vorticity pattern? What type of flow pattern is setup across the area? (More noticeable across Oklahoma and Arkansas.)

   _____
   _____
   _____
   _____

3. What do the 700 mb RH and Omega fields indicate?

_____
_____
_____
_____
_____

4. Evaluate Shreveport, LA, and surrounding upper-air soundings at 2/12z:
High Temperatures: Upper 80s/Lower 90s
Dew Points: Upper 60s.

A. What is the K index? _____

B. Total totals? _____

C. Freezing Level? _____

D. Wet bulb zero height? _____

E. CAPE (based on afternoon Max)? _____

F. LI (based on afternoon Max)?_____

G. Helicity? _____

5. On a regional background, locate surface boundaries using 18z station plot of metar data. Where is/are the surface boundary/ies located?

_____
_____
_____
_____

6. Find the following values using MSAS or LAPS data over the Ark-La-Tex.
   a. CAPE values during the afternoon? _____
   b. Lifted Index values? _____
   c. Helicity values? _____

II. Radar Data

1. **Evaluate Radar Imagery** from 2254z to 2359z for about 15 minutes (set your frame count high enough to view older data).

a. What radar signature is present in the radar storm relative velocity data at 2300z ? (Hint: look in McCurtain Co. in SE OK – may show up better in the 4 bit radar data)

_____

b. When and where is this radar signature present again?

_____

2. EVALUATION OF THE SITUATION

a. Based on the data provided…rank the following events in order of concern for this event (1 being most important)
Tornado ____ Wind ____ Hail ____ Flooding ____

b. Explain the reasoning for the answer in part a.
_____
_____
_____
_____

Part B: Warning Meteorologist

At the WES, run the simulation for **2004 Jun 3** for the times of **0030z** through **0140z**.

The Weather Forecast Office in Shreveport has decided to sectorize warnings. The area assigned to you is northeast and east Texas part of the Shreveport WFO CWA. A severe thunderstorm warning has just been issued for Marion, Upshur and Wood counties in northeast Texas effective from 730 pm until 900 pm CST. Start issuing warnings/statements at 0045z (745 pm CST).

Warning type	Begin time	Expiration time	County warned

The simulation ends at 0140z, unless you want to pursue it for a longer time period.

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Name: _____ Date: _____

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Part A: Environment and Radar Analysis

I. Environment

Let's take a look at the environment for **2 June 2004**.

At the WES, run the simulation for **2004 Jun 2** for the times 2350Z to 2359Z (This will load model and radar data for a quick evaluation).

During this first part of the simulation (~ 30 minutes) you will evaluate the environment and begin to analyze the radar data. However you will not issue any warnings (that will occur in **Part B**).

Evaluate MODEL data.
ETA and GFS available 12z and 18z
NGM available 12z

1. What are the general 250 mb height and wind speed patterns over the Southern Plains into the Lower and Mid Mississippi Valley? Is there a jet streak or favorable jet structure?
   Answer: Northwest flow with a 70-80 kt jet streak over KS/MO with the north part of the Shreveport CWA being influenced by the right entrance region of the jet streak.

2. What is the general 500 mb height and vorticity pattern? What type of flow pattern is setup across the area? (More noticeable across Oklahoma and Arkansas.)
   Answer: Northwest flow with weak disturbances in the flow.

3. What do the 700 mb RH and Omega fields indicate?
Answer: Subsidence over the area during the day allowed for extreme instability while further north, adequate moisture and lift near a cold front allowed for the initiation of convection.

4. Evaluate Shreveport, LA, and surrounding upper-air soundings at 2/12z:
High Temperatures: Upper 80s/Lower 90s
Dew Points: Upper 60s.

A. What is the K index? *29*

B. Total totals? *48*

C. Freezing Level? *13,100 ft*

D. Wet bulb zero height? *12,100 ft*

E. CAPE (based on afternoon Max)? *3000 J/Kg*

F. LI (based on afternoon Max)? *-9*

G. Helicity? *56 m2/s2*

7. On a regional background, locate surface boundaries using 18z station plot of metar data. Where is/are the surface boundary/ies located?
Answer: A cold front was located across north Oklahoma and north Arkansas.

8. Find the following values using MSAS or LAPS data over the Ark-La-Tex.
   a. CAPE values during the afternoon? *3000+ J/Kg*
   b. Lifted Index values? *-8 to -10*
   c. Helicity values? *Generally less than 70 m2/s2*

II. Radar Data

3. **Evaluate Radar Imagery** from 2254z to 2359z for about 15 minutes (set your frame count high enough to view older data).

   a. What radar signature is present in the radar storm relative velocity data at 2300z ? (Hint: look in McCurtain Co. in SE OK – may show up better in the 4 bit radar data)
   Answer: Mid altitude radial convergence (MARC) – better seen on 4 bit SRM data at radar elevation of 0.5 degrees.

   b. When and where is this radar signature present again?
   Answer: In Howard County AR at 2346z radar scan.

2. EVALUATION OF THE SITUATION

c. Based on the data provided…rank the following events in order of concern for this event (1 being most important)
Tornado *4* Wind *1* Hail *2* Flooding *3*

d. Explain the reasoning for the answer in part a.
Answer: High CAPE but low helicity more conducive to damaging wind than tornadoes. Fast moving squall line not as big a flood threat as a slower moving system would be. High wet bulb temperature limited the chance of large hail, but it cannot be ruled out.

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Warning type	Begin time	Expiration time	County warned

The simulation ends at 0140z, unless you want to pursue it for a longer time period.

Answer: Severe thunderstorm warnings should be issued along the gust front well ahead of the main squall line. Most of the wind damage occurred between the gust front and the squall line.